Claims

What is claimed is:

1. A control unit for a vehicle system, the vehicle having a plurality of reference axes, the control unit comprising:

a control unit housing adapted to be mounted upon the vehicle;

a circuit substrate mounted within said housing, said circuit substrate carrying electronic components for controlling the vehicle system;

at least one motion sensor mounted within said housing and electrically connected to said electronic components for controlling the vehicle system, said motion sensor operative to generate data concerning motion of the vehicle relative to at least one of the vehicle reference axes and to transmit said motion data to said electronic components.

2. The control unit according to claim 1 wherein a plurality of motion sensors are mounted within said control unit housing, said motion sensors being electrically connected to said electronic components for controlling the vehicle system, said motion sensors operative to generate data concerning motion of the vehicle relative to the reference axes and to transmit said motion data to said electronic components.

3. The control unit according to claim 2 wherein said plurality of motion sensors include at least one accelerometer and at least one angular rate sensor.

4. The control unit according to claim 3 wherein at least two of said motion sensors are mounted within a single electronic component package.

5. The control unit according to claim 4 wherein said electronic component package includes a signal conditioning circuit for conditioning said motion data generated by said motion sensors.

6. The control unit according to claim 5 further including a microprocessor mounted within said electronic package, said microprocessor operative to translate said motion data generated by said motion sensors to correct for the alignment of each of said motion sensors relative to said vehicle reference axes.

7. The control unit according to claim 5 further including a microprocessor mounted upon said circuit substrate, said microprocessor operative to translate said motion data generated by said motion sensors to correct for the alignment of each of said motion sensors relative to said vehicle reference axes.

8. The control unit according to claim 3 wherein said circuit substrate is a first circuit substrate and further wherein said motion sensors are mounted upon a second circuit substrate, said second circuit substrate being mounted upon said control unit housing, said second circuit substrate having electrical traces formed thereon that are electrically connected to said motion sensors.

9. The control unit according to claim 8 wherein said motion sensors are mounted upon said second circuit substrate with said motion sensors aligned with said vehicle reference axes.

10. The control unit according to claim 9 further including an electrical connector mounting upon said second circuit substrate, said second electrical connector providing an electrical connection between said first and second circuit substrates.

11. The control unit according to claim 3 wherein said circuit substrate is a first circuit substrate and further wherein said motion sensors are mounted upon a second circuit substrate, said second circuit substrate being mounted within said control unit housing, said second circuit substrate having electrical traces formed thereon that are electrically connected to said motion sensors.

12. The control unit according to claim 11 wherein the control unit is a first control unit for controlling a first vehicle system and further wherein a second control unit for controlling a second vehicle system is connected to said first control unit, said first control unit being operative to transmit vehicle motion data to said second control unit.

13. The control unit according to claim 11 wherein the control unit is adapted to be mounted within a vehicle engine compartment.

14. The control unit according to claim 11 wherein the control unit is adapted to be mounted upon a vehicle chassis.

15. The control unit according to claim 11 wherein the control unit is adapted to be mounted within a vehicle passenger compartment.

16. The control unit according to claim 11 wherein the vehicle reference axes are perpendicular to one another.

17. The control unit according to claim 11 wherein said second circuit substrate is mounted upon a generally L-shaped leadframe, said second circuit substrate carrying conductive traces that electrically connect said motion sensors to said leadframe conductors, said leadframe being mounted upon and electrically connected to said first circuit substrate.

18. The control unit according to claim 17 wherein said control unit housing is secured to a mounting bracket, said mounting bracket being adapted to be attached to the vehicle.

19. The control unit according to claim 18 wherein said mounting bracket is shaped to align said motion sensors with the vehicle reference axes.

20. The control unit according to claim 18 further including a hydraulic valve body, said control unit housing being mounted upon said hydraulic valve body, said hydraulic valve body being adapted to be connected to a vehicle hydraulic brake system, said combined control unit housing and hydraulic valve body being secured to said mounting bracket.

21. The control unit according to claim 20 wherein said mounting bracket is shaped to align said motion sensors with the vehicle reference axes.

22. The control unit according to claim 20 wherein said combined control unit housing and hydraulic valve body are included in a vehicle stability control system.

23. The control unit according to claim 20 wherein said combined control unit housing and hydraulic valve body are included in an electro-hydraulic brake system.

24. The control unit according to claim 18 wherein the control unit is included in an electric brake system.

25. The control unit according to claim 8 wherein said second circuit substrate is mounted upon a generally cylindrical base, said cylindrical base being rotatablly mounted upon said control unit housing and rotatable relative to said control unit housing to align said motion sensors with the vehicle reference axes.

26. The control unit according to claim 25 wherein said generally cylindrical base is mounted with a positioning member, said positioning member being mounted within a recess formed in said control unit housing and movable within said recess relative to the walls of said control unit housing to further align said motion sensors with the vehicle reference axes.

27. The control unit according to claim 3 wherein said circuit substrate is a first circuit substrate and further wherein said motion sensors are mounted upon a second circuit substrate, said second circuit substrate being carried by a generally cylindrical base, said cylindrical base being rotatablly mounted upon a pedestal, said pedestal being mounted upon said first circuit substrate with said base being rotatable relative to said control unit housing to align said motion sensors with the vehicle reference axes.

28. The control unit according to claim 27 wherein said pedestal is mounted upon said first circuit substrate such that said cylindrical base forms an angle relative to a wall of said control unit housing to further align said motion sensors with the vehicle reference axes.

29. The control unit according to claim 3 wherein said circuit substrate is a first circuit substrate and further wherein said motion sensors are mounted upon a second circuit substrate, said second circuit substrate being attached to said first circuit substrate with the plane of said second circuit substrate forming an angle with said first circuit substrate to align said motion sensors with the vehicle reference axes.

30. The control unit according to claim 29 wherein said second substrate is attached to said first circuit substrate with an edge of said second circuit substrate forming an angle with a wall of said control unit housing to further align said motion sensors with the vehicle reference axes.

31. The control unit according to claim 30 wherein said control unit housing has a recess formed in an inner surface thereof, said recess receiving a portion of at least one of said motion sensors whereby said motion sensor is supported by said control unit housing.

32. The control unit according to claim 3 wherein said motion sensors are mounted upon a surface of a wedge shaped support base, said support base being mounted upon said circuit substrate, said surface of said wedge shaped support base forming an angle with said circuit substrate to align said motion sensors with the vehicle reference axes.

33. The control unit according to claim 32 wherein said wedge shaped support base is mounted upon said circuit substrate with a side of said support base substrate forming an angle with a wall of said control unit housing to further align said motion sensors with the vehicle reference axes.

34. The control unit according to claim 33 wherein said control unit housing has a recess formed in an inner surface thereof, said recess receiving a portion of at least one of said motion sensors whereby said motion sensor is supported by said control unit housing.

35. The control unit according to claim 3 wherein said circuit substrate is a first circuit substrate and further wherein said motion sensors are mounted upon a second circuit substrate, said second circuit substrate being pivotally attached to said first circuit substrate with the plane of said second circuit substrate forming an angle with said first circuit substrate to align said motion sensors with the vehicle reference axes.

36. The control unit according to claim 35 wherein said pivotal attachment is mounted upon said circuit substrate with a side of said second

circuit substrate forming an angle with a wall of said control unit housing to further align said motion sensors with the vehicle reference axes.

37. The control unit according to claim 8 further including a microprocessor mounted upon said second circuit substrate, said microprocessor operative to translate said motion data generated by said motion sensors to correct for the alignment of each of said motion sensors relative to said vehicle reference axes.

38. The control unit according to claim 11 further including a microprocessor mounted upon said second circuit substrate, said microprocessor operative to translate said motion data generated by said motion sensors to correct for the alignment of each of said motion sensors relative to said vehicle reference axes.

39. The control unit according to claim 26 further including a microprocessor mounted upon said second circuit substrate, said microprocessor operative to translate said motion data generated by said motion sensors to correct for the alignment of each of said motion sensors relative to said vehicle reference axes.

40. The control unit according to claim 11 wherein said second circuit substrate is mounted within a recess formed in said control unit housing and further wherein an electrical connector provides an electrical connection between said electrical traces on said second substrate and said electronic components carried upon said first circuit substrate.

41. The control unit according to claim 40 wherein said motion sensors are disposed within a shielding housing formed from an electrically conductive material, said shielding housing also being received by said control

unit housing recess whereby said motion sensors are shielded from electromagnetic radiation.

42. The control unit according to claim 41 wherein said recess in said control unit housing may be oriented at an angle with respect to an edge of said first circuit board and further wherein said motion sensors may be oriented at an angle with respect to the edges of said second circuit board whereby said motion sensors are aligned with the vehicle reference axes.

43. The control unit according to claim 41 wherein said electrical connector includes a plurality of electrical conductors having a generally S-shape whereby the electrical connector can accommodate dimensional tolerances of components with the control unit.

44. The control unit according to claim 41 wherein said shielding housing is retained within said control housing recess by a securing clip that engages a plurality of mounting posts formed upon said control unit housing.

45. The control unit according to claim 44 wherein said control housing includes an extension formed in a sidewall thereof, said sidewall extension defining said recess.

46. The control unit according to claim 45 wherein said sidewall extension has a generally cylindrical shape and further wherein a transverse member extends across said cylinder to define said recess.

48. The control unit according to claim 46 further including at least one positioning member formed in said control unit housing opposite from said transverse member, said positioning member cooperating with said transverse member to define said recess.